

CLAIMS

What is claimed is:

1. A power factor corrected capacitor charger comprising:
 - a full wave bridge rectifier receiving AC mains power and providing a full-wave rectified DC waveform on a power line and a return line;
 - a first switch having a first pole and a second pole;
 - a second switch having a first pole and a second pole;
 - a third switch having a first pole and a second pole;
 - a fourth switch having a first pole and a second pole;
 - a first diode having an anode and a cathode;
 - a capacitor having a first pole and a second pole;
 - an inductor;

a transformer comprising a primary winding and a secondary winding, the secondary winding powering a load;

wherein:

 - the anode of the first diode is connected to the power line;
 - the first pole of the first switch is connected to the cathode of the first diode and to the first pole of the capacitor;
 - the second pole of the capacitor is connected to the return line;
 - the second pole of the first switch is connected to the first pole of the fourth switch and to a first end of the inductor;
 - a second end of the inductor is connected to a first end of the primary winding of the transformer;
 - the second pole of the fourth switch is connected to the return line;
 - the first pole of the second switch is connected to the power line;
 - the second pole of the second switch is connected to the first pole of the third switch and to a second end of the primary winding of the transformer;

2. A power factor corrected capacitor charger, according to claim 1, further comprising:

means for sensing current flowing through the primary winding, and for providing a signal indicative thereof.

3. A power factor corrected capacitor charger, according to claim 2, wherein:

the means for sensing current is selected from the group consisting of current transformer and Hall-effect sensor.

4. A power factor corrected capacitor charger, according to claim 1, wherein:

the first, second, third and fourth switches are FET transistors.

5. A power factor corrected capacitor charger, according to claim 1, wherein:

the inductor comprises a leakage inductance of the transformer.

6. A power factor corrected capacitor charger, according to claim 1, further comprising:

means for sensing current being supplied by the input full-wave bridge rectifier and providing a signal indicative thereof.

7. A power factor corrected capacitor charger, according to claim 1, further comprising:

means for providing a signal indicative of input current demand.

8. A power factor corrected capacitor charger, according to claim 1, further comprising:

means for controlling closing of the first, second, third and fourth switches in response to sensed current flowing through the inductor and the primary winding.

9. A power factor corrected capacitor charger, according to claim 1, further comprising:

an output rectifier comprising four rectifiers connected as a bridge rectifier having an input and an output;

wherein the secondary winding is connected to the input of the output rectifier.

10. A power factor corrected capacitor charger, according to claim 9, wherein:

a one of the four rectifiers is an electronically controlled switch device.

11. Method of charging a storage capacitor comprising:

providing a full-wave rectified waveform, through switches, to a primary winding of a transformer;

connecting a secondary winding of the transformer, through a bridge rectifier comprising four output rectifiers, at least one of which is a switch, to the storage capacitor;

providing an inductor in series with the primary winding of the transformer;

sensing whether there is input voltage available sufficient to drive current through the inductor and the transformer primary;

if there is input voltage available sufficient to drive current through the inductor and the transformer primary, operating the bridge rectifier as a bridge converter;

if there is not input voltage available sufficient to drive current through the inductor and the transformer primary, switching the at least one output rectifier into a conducting state thus effectively shorting the secondary winding of the transformer and storing energy in the inductor.

12. Method, according to claim 11, further comprising:

in addition to storing energy in the inductor, storing energy in a second capacitor (C1) which is selectively connected to the inductor.

13. Method of charging a capacitor, comprising:

providing a full wave bridge converter having an first bridge rectifier receiving an input voltage and providing a full-wave rectified waveform on a power line and a return line, the full wave bridge converter comprising providing four switches, one of which is connected to the power line, one of which is connected to a storage capacitor and two of which are connected to the return line and further comprising a transformer having a primary winding selectively connected to the power and return lines by the four switches;

characterized by:

providing an inductor in series with the primary winding;

sensing current flowing through the inductor and primary winding;

when the input voltage is adequate, and a first threshold current is sensed, operating the full wave bridge converter in a normal manner;

when the input voltage is insufficient to cause the current to reach the first threshold before a first predetermined timeout period, causing a next portion of the cycle to initiate and, providing that the current at the end of the first timeout period exceeds a second, lower threshold current ($+i_{min}$), continuing to operate the full wave bridge converter in a normal manner; and

if the current at the end of the first timeout period fails to reach the second threshold at the end of the timeout period, then reversing current in the primary winding and storing energy in the inductor.

14. Method, according to claim 13, further comprising:

when reversing the current in the primary winding, also storing energy in a capacitor.

15. Method of charging a capacitor, comprising:

providing a power converter having four switches selectively connecting a full wave rectified waveform to a primary winding of a transformer;

in a first portion of a cycle, sensing current flowing in the primary winding of the transformer;

controlling closures of the switches based on the sensed current flowing in the primary winding of the transformer; and

providing means for shorting a secondary winding of the transformer and for storing energy for driving the transformer in a subsequent portion of the cycle.

16. Method, according to claim 15, wherein:

the stored energy provides a boosted supply voltage for the subsequent portion of the cycle to operate the transformer when an input line voltage is low.

17. Method, according to claim 15, further comprising:

connecting a secondary winding of the transformer to an output bridge rectifier, for charging the capacitor.

18. Method, according to claim 17, wherein:

the output bridge rectifier comprises three diodes and a switch.

19. Method, according to claim 15, wherein:

the means for shorting comprises an output bridge rectifier having four rectifying elements connected to a secondary winding of the transformer wherein at least one of the rectifying elements is a switch.